

Amendments to the Claims:

This listing of claims will replace all prior versions, and listing, of claims in the above-identified application.

Listing of Claims:

1 - 38. (cancelled)

38. (original) An audio system for optimizing playing of an audio program, which includes a preferred audio signal and a remaining audio signal, for end users, which includes both hearing impaired and non-hearing impaired listeners, comprising:

a) a first end user adjustable amplifier receiving the preferred audio signal and amplifying the preferred audio signal to a level specified by the user, said first end user adjustable amplifier having a range of amplification from zero to a maximum value, and said first end user adjustable amplifier having as a control output a gain selection value representing a numerical value of the gain selected by the end user of the first end user adjustable amplifier;

b) a second end user adjustable amplifier receiving the remaining audio signal and amplifying the remaining audio signal to a level specified by the user, said second end user adjustable amplifier having a range of amplification from zero to a maximum value, and said second end user adjustable amplifier having as a control output a gain selection value representing a numerical value of the gain selected by the end user of the second end user adjustable amplifier; and

c) a feedback corrector receiving as a first input the control output of the first end user adjustable amplifier, receiving as a second input the control output of the second end user adjustable amplifier, receiving as a third input the output of the first end user adjustable amplifier, receiving as a fourth input the output of the second end user adjustable amplifier, and modifying the output of the first end user adjustable amplifier and the output of the second end user adjustable amplifier so that the actual preferred audio signal to remaining audio signal (PSRA) ratio corresponds to the end user desired value of the preferred audio signal to remaining audio signal (PSRA) ratio.

39. (original) The system according to claim 38, wherein the feedback corrector comprises:

a) a first divider receiving as a numerator input the control output of the first end user adjustable amplifier, receiving as a denominator input the control output of the second end user adjustable amplifier, and outputting the result of the numerator input divided by the denominator input, which represents the end user desired preferred audio signal to remaining audio signal (PSRA) ratio;

b) a first vector accumulator coupled to the output of the first end user adjustable amplifier, storing vector samples of the preferred audio signal;

c) a second vector accumulator coupled to the output of the second end user adjustable amplifier storing vector samples of the remaining audio signal;

d) a first peak level detector coupled to the output of the first vector accumulator, wherein the first peak detector calculates a transient amplitude of a segment of the preferred audio signal represented by the vector samples in the first vector accumulator;

e) a second peak level detector coupled to the output of the second vector accumulator, wherein the first peak detector calculates a transient amplitude of a segment of the remaining audio signal represented by the vector samples in the second vector accumulator;

f) a second divider receiving as a numerator input the output of the first peak level detector representing the transient amplitude of the segment of the preferred audio signal represented by the vector samples in the first vector accumulator, receiving as a denominator input the output of the second peak detector representing the transient amplitude of the segment of the remaining audio signal represented by the vector samples in the second vector accumulator, and outputting the result of the numerator input divided by the denominator input representing an actual value of the preferred audio signal to the remaining audio signal (PSRA) ratio;

g) a third divider receiving as a numerator input the output of the first divider representing a desired value of the preferred audio signal to the remaining audio signal (PSRA) ratio, receiving as a denominator input the output of the second divider representing an actual value of the preferred audio signal to the remaining audio signal (PSRA) ratio, and outputting the result of the numerator input divided by the denominator input, which represents a difference

between the desired and actual values of the preferred audio signal to the remaining audio signal (PSRA) ratio; and

h) a first multiplier receiving as a first input the preferred audio signal, receiving as a second input the output of the third divider, and multiplying the output of the third divider and the preferred audio signal and outputting the result, which is a corrected value of the user setting of the preferred audio signal to the remaining audio signal (PSRA) ratio.

40. (original) The system according to claim 38, wherein the feedback corrector comprises:

a) a first divider receiving as a numerator input the control output of the first end user adjustable amplifier, receiving as a denominator input the control output of the second end user adjustable amplifier, and outputting the result of the numerator input divided by the denominator input, which represents the end user desired preferred audio signal to remaining audio signal (PSRA) ratio;

b) a first vector accumulator coupled to the output of the first end user adjustable amplifier, storing vector samples of the preferred audio signal;

c) a second vector accumulator coupled to the output of the second end user adjustable amplifier storing vector samples of the remaining audio signal;

d) a first peak level detector coupled to the output of the first vector accumulator, wherein the first peak detector calculates a transient amplitude of a segment of the preferred audio signal represented by the vector samples in the first vector accumulator;

e) a second peak level detector coupled to the output of the second vector accumulator, wherein the first peak detector calculates a transient amplitude of a segment of the remaining audio signal represented by the vector samples in the second vector accumulator;

f) a second divider receiving as a numerator input the output of the first peak level detector representing the transient amplitude of the segment of the preferred audio signal represented by the vector samples in the first vector accumulator, receiving as a denominator input the output of the second peak detector representing the transient amplitude of the segment of the remaining audio signal represented by the vector samples in the second vector accumulator, and outputting the result of the numerator input divided by the denominator input representing an actual value of the preferred audio signal to the remaining audio signal (PSRA)

ratio;

g) a third divider receiving as a numerator input the output of the first divider representing a desired value of the preferred audio signal to the remaining audio signal (PSRA) ratio, receiving as a denominator input the output of the second divider representing an actual value of the preferred audio signal to the remaining audio signal (PSRA) ratio, and outputting the result of the numerator input divided by the denominator input, which represents a difference between the desired and actual values of the preferred audio signal to the remaining audio signal (PSRA) ratio;

h) a fourth divider having as a denominator input the output of the third divider, and dividing one by the output of the third divider; and

i) a multiplier receiving as a first input the remaining audio signal, receiving as a second input the output of the fourth divider and multiplying the output of the fourth divider and the remaining audio signal and outputting the result, which is the corrected value of the user setting of the preferred audio signal to the remaining audio signal (PSRA) ratio.

41. (original) The system according to claim 38, wherein the first and second vector accumulators include user selectable vector sizes.

42. (original) An audio system for optimizing playing of an audio program, which includes a preferred audio signal and a remaining audio signal, for end users, which includes both hearing impaired and non-hearing impaired listeners, comprising:

a) a plurality of user selectable frequency dependent amplification devices, each device establishing a preferred audio signal to remaining audio (PSRA) over a separate frequency band, and each of the plurality of user selectable frequency dependent amplification devices including:

(i) a first bandpass filter receiving the preferred audio signal and filtering out everything within the preferred audio signal except for a predetermined bandwidth of the preferred audio signal;

(ii) a second bandpass filter receiving the remaining audio signal and filtering out everything within the remaining audio signal except for a predetermined bandwidth of the remaining audio signal;

(iii) a first end user adjustable amplifier receiving the predetermined bandwidth of the preferred audio signal and amplifying the predetermined bandwidth of the preferred audio signal to a level specified by the user, said first end user adjustable amplifier having a range of amplification from zero to a maximum value, and said first end user adjustable amplifier having as a control output a gain selection value representing a numerical value of the gain selected by the end user of the first end user adjustable amplifier;

(iv) a second end user adjustable amplifier receiving the predetermined bandwidth of the remaining audio signal and amplifying the predetermined bandwidth of the remaining audio signal to a level specified by the user, said second end user adjustable amplifier having a range of amplification from zero to a maximum value, and said second end user adjustable amplifier having as a control output a gain selection value representing a numerical value of the gain selected by the end user of the second end user adjustable amplifier; and

(v) a feedback corrector receiving as a first input the control output of the first end user adjustable amplifier, receiving as a second input the control output of the second end user adjustable amplifier, receiving as a third input the output of the first end user adjustable amplifier, receiving as a fourth input the output of the second end user adjustable amplifier, and modifying the output of the first end user adjustable amplifier and the output of the second end user adjustable amplifier so that the actual preferred audio signal to remaining audio signal (PSRA) ratio for the predetermined bandwidth corresponds to the end user desired value of the preferred audio signal to remaining audio signal (PSRA) ratio for the predetermined bandwidth; and

b) a summing amplifier receiving the outputs of all of the plurality of user selectable frequency dependent amplification devices to create a total audio signal.

43. (original) The system according to claim 42, wherein each of the feedback correctors comprises:

a) a first divider receiving as a numerator input the control output of the first end user adjustable amplifier, receiving as a denominator input the control output of the second end user adjustable amplifier, and outputting the result of the numerator input divided by the denominator input, which represents the end user desired preferred audio signal to remaining audio signal

(PSRA) ratio;

b) a first vector accumulator coupled to the output of the first end user adjustable amplifier, storing vector samples of the preferred audio signal;

c) a second vector accumulator coupled to the output of the second end user adjustable amplifier storing vector samples of the remaining audio signal;

d) a first peak level detector coupled to the output of the first vector accumulator, wherein the first peak detector calculates a transient amplitude of a segment of the preferred audio signal represented by the vector samples in the first vector accumulator;

e) a second peak level detector coupled to the output of the second vector accumulator, wherein the first peak detector calculates a transient amplitude of a segment of the remaining audio signal represented by the vector samples in the second vector accumulator;

f) a second divider receiving as a numerator input the output of the first peak level detector representing the transient amplitude of the segment of the preferred audio signal represented by the vector samples in the first vector accumulator, receiving as a denominator input the output of the second peak detector representing the transient amplitude of the segment of the remaining audio signal represented by the vector samples in the second vector accumulator, and outputting the result of the numerator input divided by the denominator input representing an actual value of the preferred audio signal to the remaining audio signal (PSRA) ratio;

g) a third divider receiving as a numerator input the output of the first divider representing a desired value of the preferred audio signal to the remaining audio signal (PSRA) ratio, receiving as a denominator input the output of the second divider representing an actual value of the preferred audio signal to the remaining audio signal (PSRA) ratio, and outputting the result of the numerator input divided by the denominator input, which represents a difference between the desired and actual values of the preferred audio signal to the remaining audio signal (PSRA) ratio; and

h) a first multiplier receiving as a first input the preferred audio signal, receiving as a second input the output of the third divider, and multiplying the output of the third divider and the preferred audio signal and outputting the result, which is a corrected value of the user setting of the preferred audio signal to the remaining audio signal (PSRA) ratio.

44. (original) The system according to claim 42, wherein each of the feedback correctors comprises:

a) a first divider receiving as a numerator input the control output of the first end user adjustable amplifier, receiving as a denominator input the control output of the second end user adjustable amplifier, and outputting the result of the numerator input divided by the denominator input, which represents the end user desired preferred audio signal to remaining audio signal (PSRA) ratio;

b) a first vector accumulator coupled to the output of the first end user adjustable amplifier, storing vector samples of the preferred audio signal;

c) a second vector accumulator coupled to the output of the second end user adjustable amplifier storing vector samples of the remaining audio signal;

d) a first peak level detector coupled to the output of the first vector accumulator, wherein the first peak detector calculates a transient amplitude of a segment of the preferred audio signal represented by the vector samples in the first vector accumulator;

e) a second peak level detector coupled to the output of the second vector accumulator, wherein the first peak detector calculates a transient amplitude of a segment of the remaining audio signal represented by the vector samples in the second vector accumulator;

f) a second divider receiving as a numerator input the output of the first peak level detector representing the transient amplitude of the segment of the preferred audio signal represented by the vector samples in the first vector accumulator, receiving as a denominator input the output of the second peak detector representing the transient amplitude of the segment of the remaining audio signal represented by the vector samples in the second vector accumulator, and outputting the result of the numerator input divided by the denominator input representing an actual value of the preferred audio signal to the remaining audio signal (PSRA) ratio;

g) a third divider receiving as a numerator input the output of the first divider representing a desired value of the preferred audio signal to the remaining audio signal (PSRA) ratio, receiving as a denominator input the output of the second divider representing an actual value of the preferred audio signal to the remaining audio signal (PSRA) ratio, and outputting the

result of the numerator input divided by the denominator input, which represents a difference between the desired and actual values of the preferred audio signal to the remaining audio signal (PSRA) ratio;

h) a fourth divider having as a denominator input the output of the third divider, and dividing one by the output of the third divider; and

i) a multiplier receiving as a first input the remaining audio signal, receiving as a second input the output of the fourth divider and multiplying the output of the fourth divider and the remaining audio signal and outputting the result, which is the corrected value of the user setting of the preferred audio signal to the remaining audio signal (PSRA) ratio.

45 - 52. (cancelled)

53. (original) A method for optimizing playing of an audio program, which includes a preferred audio signal and a remaining audio signal, for end users, which includes both hearing impaired and non-hearing impaired listeners, comprising:

- amplifying the preferred audio signal to a level specified by the user;
- amplifying the remaining audio signal to a level specified by the user;
- computing a first ratio, the first ratio being a ratio of preferred audio signal level and the remaining audio signal level as specified by the user;
- computing the transient amplitude of the preferred audio signal;
- computing the transient amplitude of the remaining audio signal;
- generating a second ratio, the second ratio being a ratio of the computed preferred audio signal transient amplitude to an instantaneous amplitude of the preferred audio signal;
- generating a third ratio, the third ratio being a ratio of the computed secondary audio transient amplitude to an instantaneous amplitude of the remaining audio signal;
- modifying the preferred audio signal based on the second ratio; and
- modifying the remaining audio signal based on the third ratio;

wherein the preferred audio signal and the remaining audio signal are modified to maintain the first ratio during transient changes in at least one of the preferred audio signal and the remaining audio signal.

54. (original) A method for optimizing playing of an audio program, which includes a preferred audio signal and a remaining audio signal, for end users, which includes both hearing impaired and non-hearing impaired listeners, comprising:

amplifying the preferred audio signal to a level specified by a user;

amplifying the remaining audio signal to a level specified by the user; and

modifying the outputs of the preferred audio signal amplification step and the remaining audio amplification step using a feedback correction loop so that an actual preferred audio signal to remaining audio signal (PSRA) ratio corresponds to the user's desired value of the preferred audio signal to remaining audio signal (PSRA) ratio.